

Before the
FEDERAL COMMUNICATIONS COMMISSION
Washington, D.C. 20554

In the Matter of)
)
Amendment of Part 2 of the)
Commission's Rules to Allocate the) ET Docket No. 97-214
455-456 MHz, and 459-460 MHz Bands)
to the Mobile-Satellite Service)

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FEDERAL COMMUNICATIONS COMMISSION

COMMENTS OF
LEO ONE USA CORPORATION

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EXECUTIVE SUMMARY

Leo One USA Corporation ("Leo One USA") submits herein its comments to the Commission's recent Notice of Proposed Rulemaking in ET Docket No. 97-214. Leo One USA strongly urges the Commission to adopt the proposal to allocate the 455-456 MHz and 459-460 MHz bands to the Mobile Satellite Service ("MSS") in the Earth-to-space direction on a primary basis for the Non-Voice, Non-Geostationary Mobile Satellite Service ("NVNG MSS"). This allocation is critical to meeting the projected near-term requirements for the NVNG MSS and is consistent with past FCC and U.S. government positions at the 1995 World Radiocommunications Conference ("WRC-95") concerning allocation of this spectrum. It is critically important that the United States follow through domestically with proposals for the NVNG MSS made at WRC-95. To do otherwise would undermine the credibility of the United States and the NVNG MSS industry. Finally, the ability of NVNG MSS systems to share these bands on a co-primary basis with mobile and fixed systems has been amply demonstrated in both domestic and international fora during the last several years. Thus, this allocation will provide the NVNG MSS increased flexibility and capabilities without impacting other users of the bands. Leo One USA also encourages the Commission to include the WRC-97 spectrum in this proceeding and to update the Table of Allocations to reflect the *Final Acts* of WRC-95 and WRC-97.

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Leo One USA Corporation ("Leo One USA"), by its counsel, hereby submits these comments to the Commission's recent Notice of Proposed Rulemaking in ET Docket No. 97-214.¹ Leo One USA strongly urges the Commission to adopt the proposal to allocate the 455-456 MHz and 459-460 MHz bands to the Mobile Satellite Service ("MSS") in the Earth-to-space direction on a primary basis for the Non-Voice, Non-Geostationary Mobile Satellite Service ("NVNG MSS"). This allocation is critical to meeting the projected near-term requirements for the NVNG MSS and is consistent with past FCC and U.S. government positions at the 1995 World Radiocommunications Conference ("WRC-95") concerning allocation of this spectrum. It is critically important that the United States follow through with domestic allocations that match the successful proposals for the NVNG MSS made at WRC-95. To do otherwise would undermine the credibility of the United States and the NVNG MSS industry. Finally, the ability of NVNG MSS systems to share these bands on a co-primary basis with mobile and fixed systems has been amply demonstrated in both

¹ See *Amendment of Part 2 of the Commission's Rules to Allocate the 455-456 MHz and 459-460 MHz Bands to the Mobile Satellite Service*, ET Docket No. 97-214, *Notice of Proposed Rulemaking*, (released Oct. 14, 1997) ("Notice").

domestic and international fora during the last several years. Thus, this allocation will provide the NVNG MSS increased flexibility and capabilities without impacting other users of the bands.

I. Background

The *Notice* proposes to update Section 2.106 of the Commission's Rules² to incorporate in the domestically allocated NVNG MSS frequency bands the international allocations and international footnotes adopted at WRC-95. Specifically, the *Notice* proposes to allocate the 455-456 MHz and 459-460 MHz bands to the NVNG MSS. These are the bands that were allocated internationally by WRC-95 in response to a United States proposal. As the Commission is aware, these proposals were the result of extensive domestic discussions in the WRC-95 FCC Industry Advisory Committee ("IAC-95") and the WRC-95 FCC Notice of Inquiry process. The *Notice* also proposes to update the International Table of Allocations to reflect the *Final Acts* of WRC-95 for the 137-138 MHz, 148-150.05 MHz, 399.9-400.05 MHz, 400.15-401 MHz, 455-456 MHz and 459-460 MHz bands. It should be noted that the recently completed WRC-97 made additional changes to the International Table of Allocations and associated international footnotes. Specifically, WRC-97 agreed to an allocation in the 454-455 MHz band in the United States, Canada, Mexico, Panama, Indonesia, Nepal, Papua New Guinea, Cape Verde and Nigeria. Also, additional minor modifications to the existing MSS allocations at 137-138 MHz, 148-150.05 MHz and 399-400.05 MHz bands were adopted at WRC-97. Leo One USA urges the FCC to incorporate into this proceeding consideration of all these changes made at WRC-97 effective as of the effective date of the *Final Acts* of WRC-97.

² 47 C.F.R. § 2.106.

II. Requirements Exist Today for the Proposed NVNG MSS Allocations

The need for additional spectrum for the NVNG MSS has been firmly established in the U.S. WRC-95 preparatory process, at WRC-95, in the U.S. WRC-97 preparatory process and at WRC-97.³ For instance, the Interim Report of IAC-95 concludes.⁴

Assuming that the subscriber-per-megahertz of bandwidth ratio projected for the initial NGSO [NVNG MSS] supplier is constant through the planning period (500,000 per MHz) and that North America requirements drive capacity requirements and in turn, spectrum requirements, additional worldwide primary allocations of a minimum of seven MHz will be required around 2000 and 13 MHz will be required by 2010.⁵

Based on U.S. inputs and the work done in the ITU-R, the WRC-95 Conference Preparatory Meeting supported this conclusion. Specifically, the CPM Report stated:

Projections, by [NVNG] MSS system developers and others, are for about 6 million users by the year 2000. Given the time required to develop and construct satellite systems to meet the [NVNG] MSS requirements below 1 GHz, a range of an additional 7 to 10 MHz will be required in the near future.

Based on these conclusions, the United States proposed at WRC-95 that the 455-456 MHz and 459-460 MHz band (Earth-to-space) be allocated to the NVNG MSS. WRC-95 agreed to allocate this spectrum for Region 2 countries.

Based on the above inputs to WRC-95, Resolution 214 of WRC-95 stated "that in order to meet projected MSS requirements below 1 GHz, a range of an additional 7-10 MHz will be required

³ The need for additional spectrum has been further highlighted by the difficulties the Commission has had accommodating the needs of applicants in the second Little LEO processing round. It is only through limitations on the proposed systems that the applicants have been able to find a means to share the limited amount of available spectrum.

⁴ Interim Report of IAC-95, December 30, 1994.

⁵ See IAC-95 Interim Report of Informal Working Group 2 at 7.

in the near future.” The search for additional spectrum for the NVNG MSS continued through the WRC-97 preparatory process. The WRC-97 Advisory Group Report⁶ concludes that “there is insufficient spectrum available beginning in the year 2000 to accommodate the requirements for the NVNG MSS below 1 GHz service. For systems planned to be implemented around the year 2000 and later, there does not currently appear to be sufficient worldwide access in the available bands for such systems to grow and achieve commercial viability.”⁷

As the above demonstrates, there is ample evidence both in the United States and at the ITU to support the need to allocate additional spectrum to the NVNG MSS. The allocations proposed in this proceeding would be consistent with this conclusion. Such allocations would be extremely useful for the entire NVNG MSS industry by providing all existing and future NVNG MSS operators considerably more flexibility to offer uplink services. As the Commission is aware, multiple NVNG MSS systems are currently sharing a mere 1.9 MHz of uplink spectrum. Access to the 455-456 MHz and 459-460 MHz bands should alleviate some of the uplink congestion that will occur as the existing and planned NVNG MSS systems mature during the next several years. For all of these reasons, Leo One USA urges the Commission to immediately allocate this spectrum to the NVNG MSS.

⁶ See *Final Report of WAC-97 Informal Working Group 2*.

⁷ *Id.* at 10.

III. NVNG MSS Systems Can Successfully Share the Proposed Bands

Extensive analysis has been undertaken in the last few years to determine the ability of NVNG MSS systems to share the 455-456 MHz and 459-460 MHz bands with other users. Specifically, as discussed below, the NVNG MSS can share the bands with land mobile, broadcast auxiliary, and fixed services.

A. Sharing With the Land Mobile Service

In the past, the land mobile service ("LMS") community has opposed sharing of land mobile systems with NVNG MSS systems. This view is based on the belief that NVNG MSS/LMS sharing would have a detrimental impact on LMS operations. This conclusion is contrary to the facts for a number of reasons. First, the NVNG MSS is a permissive service. It can only use spectrum that is not occupied. For instance, in the uplink band, FDMA systems seek open channels or the interstitial space between channels. If openings cannot be found for narrowband NVNG MSS channels, there will be no transmissions. In general, it would not be possible for the NVNG MSS system to successfully communicate in the absence of an open channel. Spectrum sharing between FDMA NVNG MSS uplinks and LMS systems is a synergistic mix. It results in increased spectral efficiency without causing significant interference. Narrowband FDMA NVNG MSS systems use band scanning receivers and predictive algorithms to identify uplink band channels that will be clear and unused during the next uplink frame time. These channels are then assigned to FDMA NVNG MSS transceivers to use for uplink bursts. If the predictive algorithm is perfect, then the FDMA NVNG MSS transceiver transmissions will never cause interference into LMS radios.

Even if the algorithm allows an MES transmission on an in-use channel, the probability of interference is still extremely small. For interference to occur, the FDMA NVNG MSS transceiver would have to be physically located close to the LMS radio and be operated on the same frequency as that being used by the LMS radio. Even if interference did occur, it would take the form of a “click,” and the LMS operator would probably not be able to distinguish it from automotive noise or self-interference. NVNG MSS transceivers typically transmit in frequent short bursts. It is highly unlikely that an individual LMS radio operator would experience even one “click” per day from NVNG MSS transmissions.⁸

For example, if one assumes that the predictive algorithm was poor and incorrectly assigned an active channel once every five seconds. If one further assumes that the satellite footprint has a radius of 2,000 km and that a separation distance of 30 km is required between a FDMA NVNG MSS transceiver and a LMS radio operating on the same frequency at the same instant to prevent interference. In this case, a given LMS radio will have the potential of receiving interference once every 6.2 hours.

For interference to actually occur, the given LMS radio would have to be operating on the same frequency assigned to the NVNG MSS transceiver. Assuming a 2 MHz bandwidth and 25 kHz LMS radio channels, there are 80 possible channels; a given LMS radio will experience actual

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As the Commission is well aware, LMS systems today experience considerable noise (or clicks) resulting from self-interference. If the FDMA NVNG MSS predictive algorithm failed, the increase in noise beyond the level of self-interference would be negligible.

interference once every 20 days assuming it is turned on continuously. Assuming four hours per day usage results in an expected interval between interference events of four months.⁹

WAC-97 concurred with the above analysis. The WAC-97 Report found that when 1 MHz of spectrum is shared between the NVNG MSS and LMS, the mean time between interference events from a mobile earth station ("MES") transmitter to a LMS receiver ranged from 11 hours to 21 months. For MES transmissions of 500 milliseconds maximum duration, this would amount to interference ranging from .001% of the time to 10^{-6} % of the time. This is a negligible amount of interference and would have no effect on LMS systems requiring channel availabilities of 90 to 99%.¹⁰

The WAC-97 Report also concluded that a sufficient number of clear uplink channels could be found for the NVNG MSS when sharing with the LMS. Specifically, depending on system parameters, the NVNG MSS could share with more than 38,000 to 190,000 LMS users for the worst case situation where the satellite beam is viewing the entire CONUS. For the more typical situations, where only 30% of the land area is in view, the NVNG MSS system could share with 114,000 to 570,000 LMS users in 1 MHz of shared spectrum.

The preceding analyses are based upon co-allocation of NVNG MSS and LMS in the same 1 MHz frequency band. However, the sharing environment improves considerably when band scanning receivers are used in the NVNG MSS satellites. This would allow the NVNG MSS satellites to identify channels that are temporarily unused by the terrestrial systems. The NVNG

⁹ See Leo One USA Uplink Band Interference Analysis Report, April 12, 1995 for further information on this analysis.

¹⁰ See WAC-97 Report.

MSS satellites would then only assign those unused channels to the MES for uplink transmissions to the satellites. Thus, interference into LMS receivers would be further avoided by transmitting only on terrestrial service channels that are unused.

Thus, a number of techniques exist to allow and promote sharing between the NVNG MSS and LMS including: band scanning receivers used in the NVNG MSS space stations coupled with frequency agile transmitters in the mobile earth stations; short duration and low duty cycle signals used for uplink transmissions, and narrowband FDMA uplinks. These techniques create an environment with low probability of interference that enables sharing between the two services.

WRC-95 identified additional analyses to be performed in preparation for WRC-97 and to prepare for the possibility of additional international allocations for the MSS below 1 GHz. These additional studies were not required for the existing allocations, but rather were aimed at providing a technical basis for additional allocations. In particular, Resolution 214 (WRC-95), resolved “that further studies are urgently required on operational and technical means to facilitate sharing between the non-GSO/MSS and other radiocommunications services. . . .” Studies were performed in the 1995-1997 period and the results were presented domestically to WAC-97 and internationally to ITU-R Working Party 8D. These studies showed the feasibility of co-frequency sharing between NVNG MSS and terrestrial services at frequencies where additional allocations might be considered by WRC-97.

Resolution 214 (WRC-95) further noted “that new technologies of some radiocommunications services, especially within the terrestrial mobile and broadcasting services, which require spectrum below 1 GHz, may have an impact on the sharing possibilities.” Among the

new technologies being implemented in the LMS, is the narrower channelization resulting from the re-farming of the bands in the 450-470 MHz range. As WAC-97 analyses showed, re-farming allows a greater number of LMS users to co-frequency share with the NVNG MSS in a given bandwidth.¹¹ Re-farming requires the LMS systems to decrease channel bandwidth so as to increase the total number of available channels. However, when the LMS channel bandwidth decreases, the probability of interference from NVNG MSS to terrestrial LMS users also decreases. Thus, the new technology benefits NVNG MSS/LMS sharing. Given the above, Leo One USA believes that a primary allocation made to the MSS in the 455-456 MHz and 459-460 MHz bands, with technical sharing requirements, would be sufficient to protect incumbent LMS operations in today's environment as well as in the new LMS environment.¹²

B. Sharing With the Broadcast Auxiliary Service

NVNG MSS systems can also share successfully with terrestrial broadcast remote pickup operations. These systems are operated on an intermittent basis. However, unlike LMS, these systems are used less frequently but for longer duration. These differences may indicate a slightly different approach for NVNG MSS/broadcast remote pickup sharing. For instance, the band scanning receivers may find particular channels in the 455-456 MHz band are unused for relatively long periods of time. Thus, a particular auxiliary broadcast channel may be available for a

¹¹ See WAC-97, *Final Report* of IWG 2A at Section 4.4.3.

¹² A requirement for NVNG MSS systems to use band scanning receivers, duty cycles and dynamic channel assignment techniques would virtually preclude interference into active terrestrial LMS channels. The use of band-scanning receivers on the MSS satellites avoids uplink transmissions at the frequencies that are in use at that time by the terrestrial systems. The use of short duration (450 milliseconds or less uplink) transmissions further mitigates against the possibility of harmful interference.

substantial number of 450 millisecond NVNG transmissions. This is in sharp contrast to the sharing approach used in the 148-149.9 MHz bands, where the Commission has imposed limitations both on the duration and the frequency of use of the same channel by the NVNG MSS uplinks. In light of this environment, the best approach to frequency sharing may be to allow repeated use of the same channel in a particular area. Under this approach, during periods of remote pickup transmissions, the band scanning receivers would see the remote pickup channels as continuously active, and no attempt would be made to assign the in-use channels for NVNG MSS uplinks. When channels are not in use, the satellite system could use channels virtually continuously for uplinks. When a terrestrial remote broadcast pickup begins, the band-scanning receiver in the satellite would immediately detect the channel use, and that channel would no longer be assigned for NVNG MSS uplinks until the terrestrial operations had ceased.¹³ Thus, Leo One USA does not believe it necessary to impose a duty cycle on this band.

C. **Sharing With the Petroleum Radio Service and Basic Exchange Telephone Service**

In the past, questions have been raised whether narrow-band NVNG MSS systems could share frequency with the Petroleum Radio Service or the Basic Exchange Telephone Service ("BETRS"). The Petroleum Radio Service is a LMS while BETRS is a fixed service. The same

¹³ The analysis presented to the WAC-97, IWG-2A *Final Report* is a baseline analysis for a commonly occurring scenario and does not cover every particular sharing scenario that might be encountered. For the case of increased height of base station antennas, the analysis has been extended to apply to antenna heights of 60 meters, and the probabilities of interference were found to be so low that the interference criteria of no more than 10% increase in unavailability for a 99% availability channel could still be met. The use of directional or higher gain antennas by broadcast remote pick-up would reduce the potential for interference to the broadcast remote pick-up operations. See Addendum to Doc. IWG-2A/59 (Rev. 2), February 13, 1997, and IWG-2A, Document 57 submitted by Land Mobile Communications Council, July 30, 1996.

analysis discussed above for the LMS applies to sharing between the NVNG MSS and the Petroleum Radio Service. The Commission's Report issued prior to WRC-95 concluded:

We believe that the technical analyses presented by the system proponents corroborate that channel assignment and low power techniques, in conjunction with brief message duration and geographical separation similar to those adopted by the Commission in § 2.106, Table of Allocations, for other frequency bands, can be used successfully to assure that oil spill containment operations are not adversely affected.¹⁴

Nothing has been placed in the record in any FCC activities relating to WRC-97 or in the recently concluded Little LEO rulemaking proceeding¹⁵ that contradicts this conclusion.

The WAC-97 *Final Report* concludes that sharing between fixed services such as BETRS and the NVNG MSS would be essentially identical to the sharing issues raised between LMS and NVNG MSS. Thus, with the appropriate protections, narrow-band NVNG MSS and fixed services should be able to successfully share the same spectrum.

D. Failure of the Commission to Allocate the Proposed Spectrum as a Result of Opposition from Incumbent Users Would Undermine U.S. Positions at Future WRCs and the NVNG MSS Industry

During the last several years, the U.S. government has expended considerable energy developing proposals to allocate spectrum at WRC-95 and WRC-97 for the NVNG MSS. At WRC-95, the U.S. proposal to allocate the 455-456 MHz and 459-460 MHz was successful. This allocation was made after extensive technical discussions in the United States and at WRC-95. For the FCC to now conclude in a domestic allocation proceeding that U.S. positions at WRC-95 were not technically sound would undermine U.S. credibility at future WRCs. This is an issue not to be

¹⁴ See Report in IB Docket No. 94-31, FCC 95-256 at para 26.

¹⁵ See IB Docket No. 96-220.

taken lightly. The technical integrity of U.S. positions at WRCs is probably the United States' strongest asset at the ITU. To turn around and now argue that earlier proposals were not technically correct would undermine U.S. credibility at the ITU.

Equally important, such an about face would be devastating to the NVNG MSS industry. As the Commission is well aware, the Little LEO industry had an extremely difficult time at WRC-95 and WRC-97. Failure of the FCC to allocate the 455-456 MHz and 459-460 MHz bands to the MSS could be viewed as an abandonment of the NVNG MSS industry by the U.S. government. This would make it all but impossible to obtain allocations for the NVNG MSS at future WRCs.

IV. Other Issues

A. NVNG MSS Systems Can Use the 459.025-495.65 MHz Band

The Commission in the *Notice* requests comment on the feasibility of auctioning the 459.025-459.65 MHz segment to Part 22 licensees and also using this spectrum for Little LEO operations. As is discussed above, the NVNG MSS and LMS can successfully share the same frequency without any impairment to either service. The fact that LMS licenses are awarded by auction does not change this conclusion. The winner of an LMS auction will design and operate its system in a manner consistent with Part 22 of the Commission's Rules. The introduction of NVNG MSS into the same bands will not change LMS operations or impact the economic value of the auctioned spectrum.

B. WRC-97 Spectrum Should Be Included in This Proceeding

WRC-97 allocated the 454-455 MHz to the MSS in the United States, Canada, Mexico, Panama, Indonesia, Nepal, Papua New Guinea, Cape Verde and Nigeria in the Earth-to-space direction. This allocation was made pursuant to a proposal made by the United States at WRC-97 which was supported by both LMS and NVNG MSS interests. The *Final Acts* of WRC-97 enter into force on January 1, 1999. As the Commission is aware, this additional one MHz could be extremely useful to the NVNG MSS. It will further enhance NVNG MSS operations to meet present and future demand. The 454-455 MHz band is currently used by the LMS. Thus, the same sharing analysis discussed above for the 455-456 MHz and 459-460 MHz bands would be applicable to the 454-455 MHz band.

If the Commission fails to allocate this spectrum in this proceeding, it would be forced to initiate yet another rulemaking. This would be a waste of both Commission resources and the resources of all the parties who have an interest in this band. Therefore, Leo One USA urges the Commission to use this proceeding to allocate the 454-455 MHz band domestically for the MSS. In order to confirm the allocation of this spectrum to the effective date of the *Final Acts* of WRC-97, Leo One USA urges the Commission to make the effective date for this allocation January 1, 1999.

C. The Commission Should Update the Table of Allocations to Reflect the Final Acts of WRC-95 and WRC-97

WRC-95 and WRC-97 made a number of changes to the International Table of Allocations. Leo One USA urges the Commission to conform the International Table of Allocations in Part 2 of its Rules to reflect these changes.¹⁶

¹⁶ Again, the changes made at WRC-97 should become effective on January 1, 1999.

CONCLUSION

The NVNG MSS systems are currently faced with a severe shortage of spectrum. This shortage will have a direct impact on the ability of the NVNG MSS industry to grow and to offer a variety of services to the public. The Commission's proposal to allocate the 455-456 MHz and 459-460 MHz bands will enhance the NVNG MSS' ability to meet the public's demand for Little LEO services. For all the above reasons, Leo One USA urges the Commission to immediately allocate this spectrum to the Mobile Satellite Service.

Respectfully submitted,

A handwritten signature in black ink, appearing to read "Robert A. Mazer", written over a horizontal line.

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